

**D g n o (B R )**  
 $R1 = 1 \text{ k} \Omega, R2 = 1 \text{ k} \Omega$

**NPN Transistors with Monolithic Bias**

# MUN2230, MMUN2230L, MUN5230, DTC113EE, DTC113EM3, NSBC113EF3

**Table 1. ORDERING INFORMATION**

Device	Part Marking	Package	Shipping†
SMUN2230T1G*	8G	SC-59 (Pb-Free)	3000 / Tape & Reel
MMUN2230LT1G, NSVMUN2230LT1G*	A8G	SOT-23 (Pb-Free)	3000 / Tape & Reel
MUN5230T1G	8G	SC-70/SOT-323 (Pb-Free)	3000 / Tape & Reel
DTC113EET1G	7Q	SC-75 (Pb-Free)	3000 / Tape & Reel
DTC113EM3T5G, NSVDTC113EM3T5G*	7A	SOT-723 (Pb-Free)	8000 / Tape & Reel

**DISCONTINUED** (Note 1)

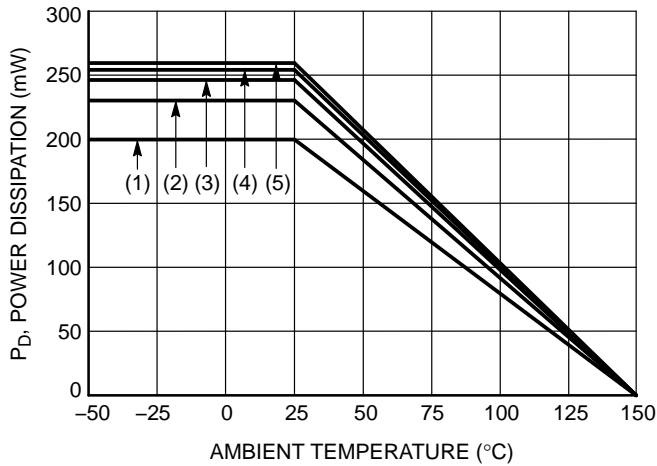
MUN2230T1G	8G	SC-59 (Pb-Free)	3000 / Tape & Reel
NSBC113EF3T5G	D (180°)**	SOT-1123 (Pb-Free)	8000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

\*\* (xx°) = Degree rotation in the clockwise direction.

1. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on [www.onsemi.com](http://www.onsemi.com).



- (1) SC-75 and SC-70/SOT323; Minimum Pad
- (2) SC-59; Minimum Pad
- (3) SOT-23; Minimum Pad
- (4) SOT-1123; 100 mm<sup>2</sup>, 1 oz. copper trace
- (5) SOT-723; Minimum Pad

**Figure 1. Derating Curve**

# MUN2230, MMUN2230L, MUN5230, DTC113EE, DTC113EM3, NSBC113EF3

**Table 2. THERMAL CHARACTERISTICS**

Characteristic		Symbol	Max	Unit
<b>THERMAL CHARACTERISTICS (SC-59) (MUN2230)</b>				
Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 2) (Note 3)	$P_D$	230 338	mW
Derate above $25^\circ\text{C}$	(Note 2) (Note 3)		1.8 2.7	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 2) (Note 3)	$R_{\theta JA}$	540 370	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 2) (Note 3)	$R_{\theta JL}$	264 287	$^\circ\text{C/W}$
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$
<b>THERMAL CHARACTERISTICS (SOT-23) (MMUN2230L)</b>				
Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 2) (Note 3)	$P_D$	246 400	mW
Derate above $25^\circ\text{C}$	(Note 2) (Note 3)		2.0 3.2	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 3)	$R_{\theta JA}$	508 311	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 2) (Note 3)	$R_{\theta JL}$	174 208	$^\circ\text{C/W}$
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$
<b>THERMAL CHARACTERISTICS (SC-70/SOT-323) (MUN5230)</b>				
Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 2) (Note 3)	$P_D$	202 310	mW
Derate above $25^\circ\text{C}$	(Note 2) (Note 3)		1.6 2.5	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 2) (Note 3)	$R_{\theta JA}$	618 403	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 2) (Note 3)	$R_{\theta JL}$	280 332	$^\circ\text{C/W}$
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$
<b>THERMAL CHARACTERISTICS (SC-75) (DTC113EE)</b>				
Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 2) (Note 3)	$P_D$	200 300	mW
Derate above $25^\circ\text{C}$	(Note 2) (Note 3)		1.6 2.4	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 2) (Note 3)	$R_{\theta JA}$	600 400	$^\circ\text{C/W}$
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$
<b>THERMAL CHARACTERISTICS (SOT-723) (DTC113EM3)</b>				
Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 2) (Note 3)	$P_D$	260 600	mW
Derate above $25^\circ\text{C}$	(Note 2) (Note 3)		2.0 4.8	mW/ $^\circ\text{C}$

2. FR-4 @ Minimum Pad.
3. FR-4 @ 1.0 x 1.0 Inch Pad.
4. FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces, still air.
5. FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces, still air.

**MUN2230, MMUN2230L, MUN5230, DTC113EE, DTC113EM3, NSBC113EF3**

**Table 2. THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
----------------	--------	-----	------

**THERMAL CHARACTERISTICS (SOT-723) (DTC113EM3)**

Thermal Resistance, Junction to Ambient	(Note 2) (Note 3)	$R_{\theta JA}$	480 205	$^{\circ}\text{C}/\text{W}$
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +150	$^{\circ}\text{C}$

**THERMAL CHARACTERISTICS (SOT-1123) (NSBC113EF3)**

Total Device Dissipation $T_A = 25^{\circ}\text{C}$	(Note 4) (Note 5)	$P_D$	254 297	mW
Derate above $25^{\circ}\text{C}$	(Note 4) (Note 5)		2.0 2.4	$\text{mW}/^{\circ}\text{C}$
Thermal Resistance, Junction to Ambient	(Note 4) (Note 5)	$R_{\theta JA}$	493 421	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Lead	(Note 4)	$R_{\theta JL}$	193	$^{\circ}\text{C}/\text{W}$
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +150	$^{\circ}\text{C}$

2. FR-4 @ Minimum Pad.
3. FR-4 @ 1.0 x 1.0 Inch Pad.
4. FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces, still air.
5. FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces, still air.

**Table 3. ELECTRICAL CHARACTERISTICS** ( $T_A = 25^{\circ}\text{C}$ , unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

TYPICAL CHARACTERISTICS  
 MUN2230, MMUN2230L, MUN5230, DTC113EE, DTC113EM3, NSBC113EF3

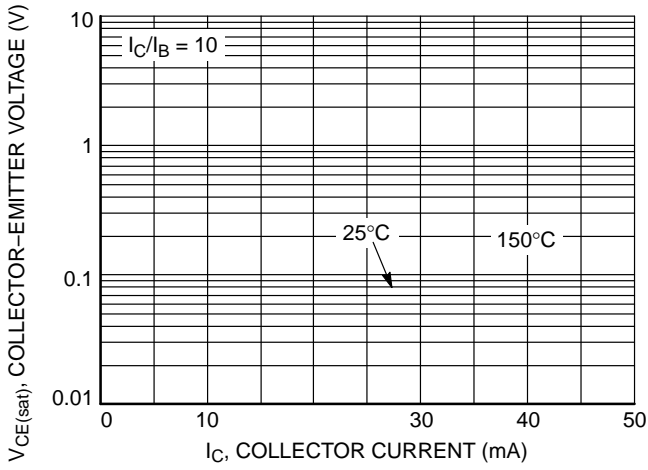


Figure 2.  $V_{CE(sat)}$  vs.  $I_C$

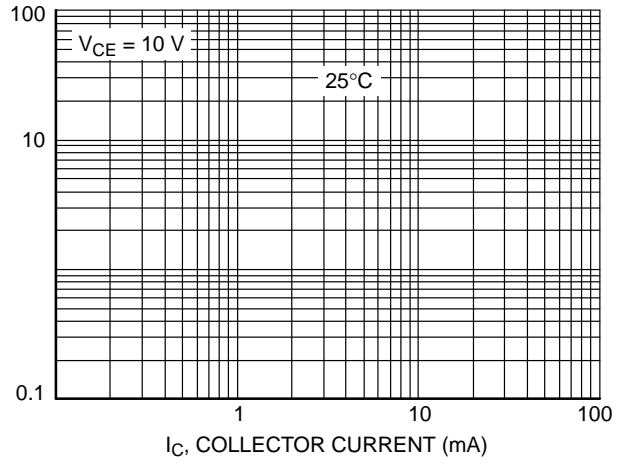


Figure 3. DC Current Gain

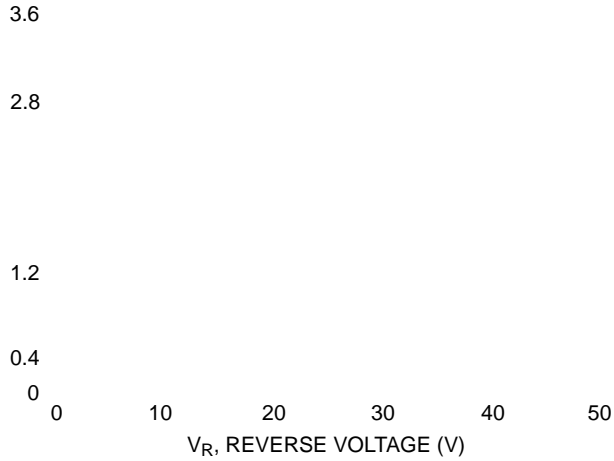


Figure 4. Output Capacitance

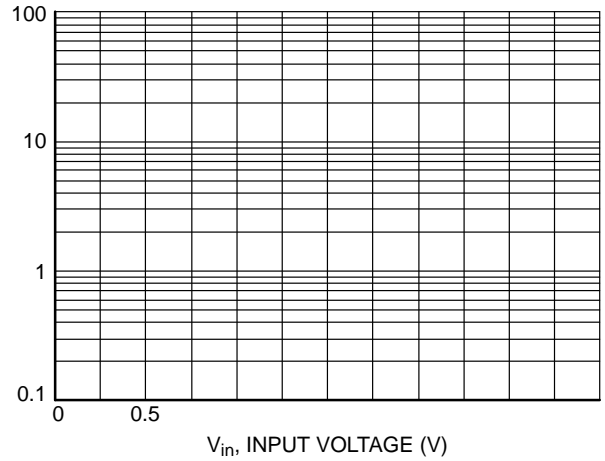


Figure 5. Output Current vs. Input Voltage

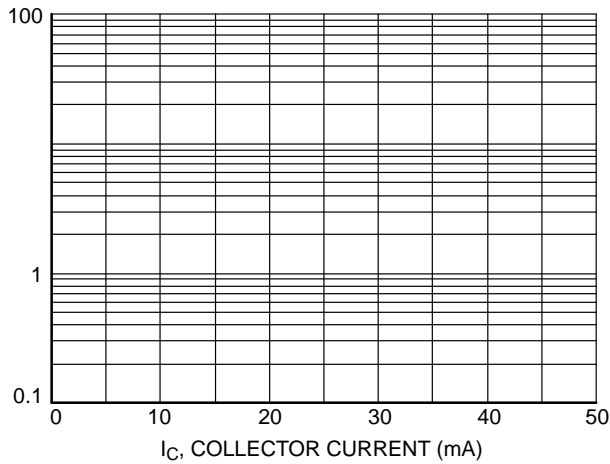
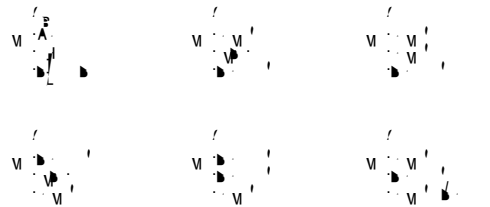
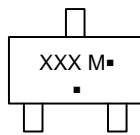
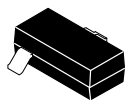


Figure 6. Input Voltage vs. Output Current

SC-59-3 2.90x1.50x1.15, 1.90P  
CASE 318D  
ISSUE J

DATE 15 FEB 2024





SCALE 4:1

SOT 23 (TO 236) 2.90x1.30x1.00 1.90P  
CASE 318  
ISSUE AU

DATE 14 AUG 2024

**SOT 23 (TO 236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 7:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 8:  
PIN 1. ANODE  
2. NO CONNECTION  
3. CATHODE

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 10:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE

STYLE 11:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 13:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE

STYLE 14:  
PIN 1. CATHODE  
2. GATE  
3. ANODE

STYLE 15:  
PIN 1. GATE  
2. CATHODE  
3. ANODE

STYLE 16:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE

STYLE 17:  
PIN 1. NO CONNECTION  
2. ANODE  
3. CATHODE

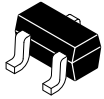
STYLE 18:  
PIN 1. NO CONNECTION  
2. CATHODE  
3. ANODE

STYLE 19:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE-ANODE

STYLE 22:  
PIN 1. RETURN  
2. OUTPUT  
3. INPUT

STYLE 23:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE  
3.



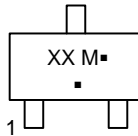


SCALE 4:1

**SC-70 (SOT-323)**  
CASE 419  
ISSUE R

DATE 11 OCT 2022

**GENERIC  
MARKING DIAGRAM**



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking.  
Pb-

STYLE 1:  
CANCELLED

STYLE 2:  
PIN 1. ANODE  
2. N.C.  
3. CATHODE

STYLE 3:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 4:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 5:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 6:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 7:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 8:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 9:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 10:  
PIN 1. CATHODE  
2. ANODE  
3. ANODE-CATHODE

STYLE 11:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE



-

RECOMMEND



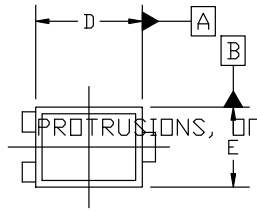


**SOT-1123 0.80x0.60x0.37, 0.35P**  
**CASE 524AA**  
**ISSUE D**

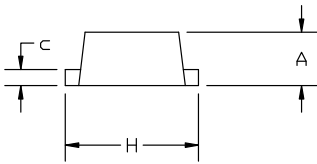
DATE 18 JAN 2024

NOTES:

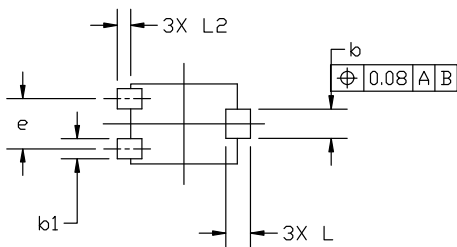
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS, ASH,



TOP VIEW



SIDE VIEW

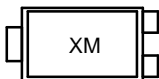


BOTTOM VIEW

← GATE BURRS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.15	0.22	0.2
			0.5
e	0.35	0.38	0.40
H	0.950	1.000	1.050
L	0.185 REF		
L2	0.05	0.10	0.15

**GENERIC MARKING DIAGRAM\***



- X = Specific Device Code
- M = Date Code

RECOMMENDED MOUNTING FOOTPRINT

\*

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

STYLE 1:  
 PIN 1. BASE  
 2. EMITTER  
 3. COLLECTOR

STYLE 2:  
 PIN 1. ANODE  
 2. N/C  
 3. CATHODE

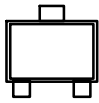
STYLE 3:  
 PIN 1. ANODE  
 2. ANODE  
 3. CATHODE

STYLE 4:  
 PIN 1. CATHODE  
 2. CATHODE  
 3. ANODE

STYLE 5:  
 PIN 1. GATE  
 2. SOURCE  
 3. DRAIN

SOT-723 1.20x0.80x0.50, 0.40P

GENERIC  
MARKING



**onsemi**, **onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi**

---

---